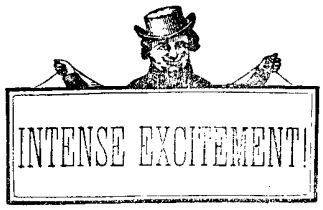
PYRO-32
TIMEWARP!

MERRY CHRISTMAS, WORLD



Hello world and Merry Christmas! It's time for another Pyro, full of strangeness and typos. For those of you who don't know what that means, this is a publication for distribution amongst the members of the organization known as General Technics. However, it is also going to serve as a letter to all my friends and relatives who aren't members of GT, some of whom don't even know that my nickname is Cap'n Al! This issue is being financed out of my own pocket, so you GT'ers only have to worry about your own stamps being used up. Not all the information will apply to everybody (my grandmother will probably not be too interested in how to do gold reprocessing). It is also a parallel/post mailing for APA-TECH. After a major disappearing act this summer it's time to once again open the files and sit down at the computer and write. I'm doing it on the Wang text processor here at Woods Hole Oceanographic, a much more versatile machine than the Univacki 1110 I used at MTU.

For those of you who haven't heard, I graduated from Michigan Tech last may with a Bachelor's Degree in Electrical Engineering. After throwing the usual resumes & cover letters into the mail I sat back to await the flood of job offers. Not very many materialized. I wasn't surprised, having decided that I wasn't going to go to California and thereby cutting myself off from 2/3rd's of the electronics industry. I did get a return letter from Arecibo Observatory, though, but it wasn't even signed by Carl Sagan!

So, in June John Frambach and I took off on a crazed journey through Canada with a canoe on top of my Honda. Objective: get to the other side! After stopping to assist at an accident, stopping to repair the car (several times), stopping to sleep, stopping to eat, stopping at customs, we finally fell back into the U.S.. What followed included job hunting, sightseeing, visiting relatives, lots of driving, four-wheeling up the side of Grandpa's Knob in an attempt to get to the site of the old Smith-Putnam wind generator (in my Honda, of course), and suddenly popping out of the woodwork in New York City and surprising Roxanne. We finished off the trip by stopping in at Inconjunction, Indianapolis' first SF convention. Congrats to Mary Lynn & the gang for a job well done.

The end result of all of this madness is that I am now gainfully employed at Woods Hole Oceanographic Institute (called WHOI and pronounced whoo-ee for short). I am a Junior Engineer - actually, no such classification exists here, but they didn't want to offer me a job as only a technician. I think I clinched the job by pulling a high voltage capacitor that they needed out of my techie kit when I was interviewing. My official "boss" is Dr. A.J. Williams III, called Sandy. Why, you may ask, am I working here instead of at DEC or IBM where I could get double or more the salary? Because, by God, I get to work with SCIENCE (at least that's what Tom Swift would have said). My job is being paid for being a Techie! I don't work on boring little subsections of some giant computer system trying to save "The Company" a few hundred thou a year. I work on state of the art oceanographic instrumentation. I'm having a whale of a good time at work and getting paid to boot! Not only that, but I'm ending up with some real good scrounge that dates after '75!

I don't even have to wear a suit to work! Yay!

Here's how the story goes: At the beginning of July I packed all my worldly goods (quite a lot) into a 20 foot Yoo-Haul and headed out across the dusty plains of Ohio. Just east of Toledo I came across a Goodyear blimp hotrodding across the sky. The pilot was trying to emulate a roller coaster and doing a good job! My brother followed along in my Honda. We stopped in Rochester for Mike & Alice's housewarming (held at Jeff & Carol's, of course) for the weekend, then headed on to Vermont. Another day was spent visiting my Mom and picking up my piano, then onward to Woods Hole.

I had arrived in Woods Hole during mid-July, height of the tourist season! The first week I spent in a rooming house while my posessions stayed in the truck in one of the WHOI parking lots. I ate in restaurants since I couldn't even get a room with kitchen priviledges. Since there was no chance of me finding an apartment (believe me, I tried) I moved all the stuff out of the truck and into Sandy's basement. August came and I found myself watching a house for a woman who was out of town and watching all my stuff turn green, brown and yellow with mold in my Sandy's damp basement.

At the beginning of September the tourists left and it became almost safe to drive again. The night before I left for Denvention I finally got my stuff out of the basement and into an apartment and finished my loft. My apartment is on the second story of a barn that has been refinished. I live in the owner's "basement". The barn is on nine wooded acres a mile and a half north of WHOI. That is amazing considering how crowded this area is.

Somewhere in the midst of all of that I made my east coast theatrical debut with the Penzance Players, a summer repertory theatre group. I acted as technical wizard for the current production after their lighting person walked off, and did up the sound and electrical effects. We went from bare stage to full production in 9 days! It brought back many of the few fond memories I have of high school, working 18 hour days with a bunch of folks almost as loony as I am. The second production I was involved in just closed. I simulated a piano (with electronics, silly). Seems that the director had not gotten people for the lead parts who could play piano.

At work I started out by being loaned to Dr. Yogesh Agrawal (Yogi - and yes toots, he is from India but he can speak English!) and Bill Terry for the LDV project. The LDV (Laser Doppler Velocimeter) is an instrument used to non-invasively measure the current from a millimeter to a meter off the surface of the ocean floor at up to five kilometers depth. It does so by starting out with a 20 milliwatt He-Ne laser, the output of which is split into three beams. Each beam is modulated by a Bragg cell - a sort of optical volume control that costs $400. The beams are then brought out of the instrument and focused on a point in space in front of the instrument. Using a telephoto (not zoom) lens, the distance from the front of the instrument at which the focus occurs can be controlled. At the point where the beams intersect, an interference pattern is created with brightness peaks that move past that given point. If a sediment particle stumbles into the beam intersection, it will reflect light that appears to be varying in intensity at the beat frequency of the modulation frequencies of the intersecting beams. If two of the beams are modulated at 38 and 39 Mhz, the reflected light will vary in amplitude at 1 Mhz. If the particle is moving, that beat frequency will be doppler shifted up or down. A photomultiplier tube detects the very weak reflection and a commercially available set of boards determines the doppler shift. If the three beams are brought together so that the plane formed by the paths of beams 1 & 2 is perpendicular to the plane formed by the paths of beams 1 & 3 and the beat frequency between beam 1 & 2 is different than that of beam 1 & 3 (the 2 & 3 beat frequency is filtered out), you can determine the velocity of the reflecting particle in both directions perpendicular to the long axis of the instrument (the main tube is 7' long and 7.5" in diameter with a separate case for batteries and data recorder). A simple trig calculation then yields its velocity and direction.

If the particle is small enough, it will be traveling at the same speed as the water surrounding it. By fancy filtering the particle size that is of interest is seen while the instrument is "blind" to big chunks. All this takes lots of power and a horrendous set of optics. We have the only known optical window in the world known to be capable of withstanding 550 atmospheres on the outside, one atmosphere on the inside and not distorting! It's six inches in diameter and three inches thick. Most instruments here at WHOI use CMOS and run for a year or more at station out in the ocean (guess who got some of the first CMOS off the line?). The LDV on the other hand sucks dry a battery pack of 158 'D' size Duracells in just over five hours - even with switching regulators! Hence the nickname "The world's largest flashlight".

The escapades on the cruise the LDV was deep ocean tested on are printed later in this issue.

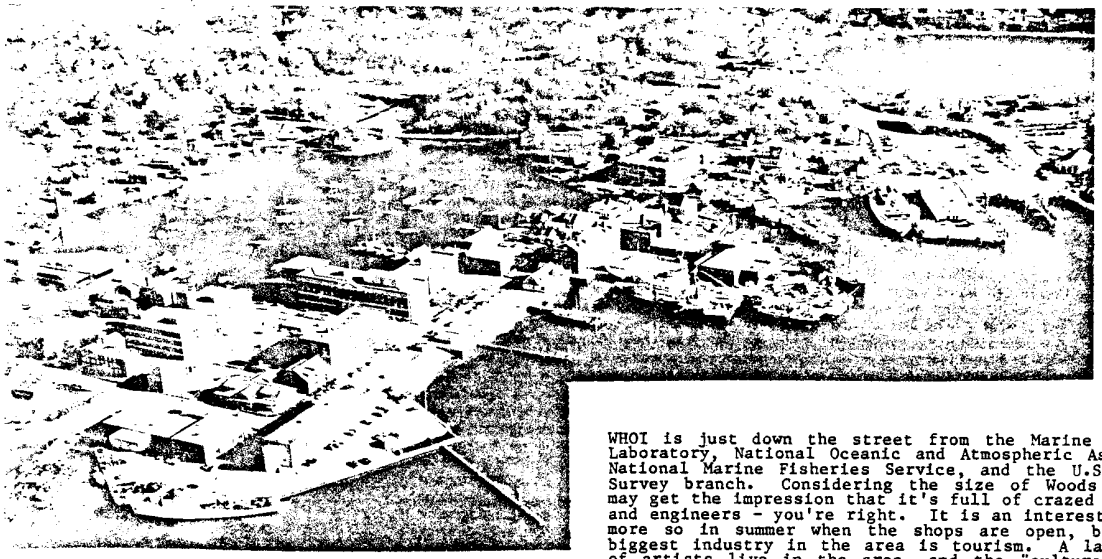
Since mid-October I've been working on the Pop Up Profiler (PUP) project for Al Bradley. GT has all the Bill's and WHOI seems to have all the Al's. The PUP is designed to be sent to the bottom of the ocean where it releases probes. The probe housings are made of syntactic foam (a foam made out of glass which is very strong and resists crushing at the ocean bottom) and the probes are carefully ballasted so that they float up to the surface at a certain speed. Inside each probe is a 15 Khz acoustic generator and hydrophone which pumps about a tenth of a watt of acoustic power out into the water. The instrument package on the "lander" monitors the signal and detects phase variances in the 15 Khz signal. These phase variances hold information pertaining to something or other in the water column above the lander (I'm not sure, me, I'm just a engineer.....). Just kidding - the phase variances yield information on the currents in the water column (doppler shifts again - aiyeeeeee!). The probes are released by the lander at a rate of one per day and are not expected to be recovered (Jaques Cousteau probably ends up finding them). I've been building the receiving hydrophone preamps on the lander that must be able to receive the signal from the probes from less than a meter away at depth to 5 km above when the probe reaches the surface. The signal gets to a level that is about 95 db below that of a 10 Khz acoustic locating beacon on the lander! The preamps reject enough of the 10 Khz so that they don't saturate and with an array of tuned traps, phase-locked loops, and crystal filters after the preamps we manage to recover a useable signal. The lander's receiving hydrophone preamps and probe oscillator and amplifier circuits are so small that the pins have to be trimmed to 30% on the IC's! The probes have built in suicide circuits that turn them off after a few hours so they don't interfere with later launched probes.

I have finished my dive testing and am now a WHOI certified work diver. I was passed from the provisional level to the 30 foot certification. This means that I can work to 30' with another diver unless he has a certification to a deeper level in which case I can work down to 70' (the next deeper certification level). After twelve dives below 30', considered to be training dives for deeper work, I get my 70' certification. Then comes the 100 and 130' certifications. Deeper than that requires special training and a recompression chamber within a certain time's travel. OSHA rides again!

As I am typing this my hair is still wet from today's dives. My fingers, however, are dry lest I incur a visit from the Blue Spark Fairy who lives deep within the computer. The first dive was to watch the PUP in action off the end of the pier and see if all went well with it - it did. The second was to try and locate a boat fender that we had seen on an earlier dive and recover it. We had a half knot of current and low visibility so we never even saw it. The most amazing thing is that the water is salty out here!

I was scheduled to go on a research cruise out of Panama on the Glomar Challenger (Glomar Explorer is the CIA, etc. ship) on Dec. 26, but that has been cancelled. The second ship that was to have taken part in the experiment won't be out of drydock in time. I was supposed to act as an electronic technician for a seismic borehole experiment in the Atlantic. We were to have stuck a special seismic hydrophone down in a deep borehole and listened while the other ship went off into the distance dropping explosive charges into the water. The borehole electronics must operate in a 200° C environment - hot enough to melt normal solder! As a consolation prize Al Bradley has offered to try and get me onto his cruise to work on the PUP deployment.

In the future I may be working on such things as dissolvable sugar foam model airplanes for remote delivery of disposable sensors, Acoustic Tomography (like a CAT scanner but using acoustic signals to map temperatures, currents and other properties of the oceans), a LIDAR (laser radar of sorts) which may even use my Neodymium/Glass laser rod, and other strange and wonderous devices.



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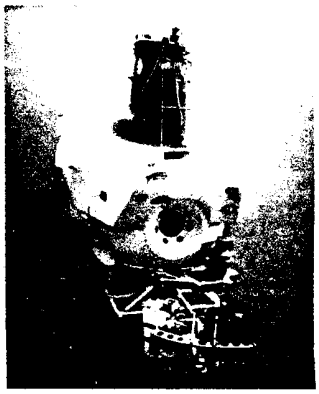
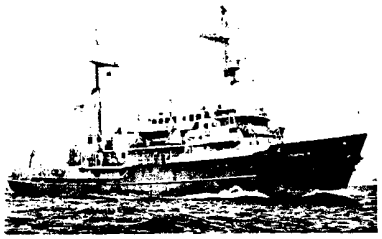
WHOI is just down the street from the Marine Biological Laboratory, National Oceanic and Atmospheric Association, National Marine Fisheries Service, and the U.S. Geologic Survey branch. Considering the size of Woods Hole, you may get the impression that it's full of crazed scientists and engineers - you're right. It is an interesting place, more so in summer when the shops are open, because the biggest industry in the area is tourism. A large number of artists live in the area, and the "culture" includes frequent concerts and plays. There are two downtown bars, one of which is closed January through April. The larger support town of Falmouth is just 3 miles north and sports a population of 18,000.

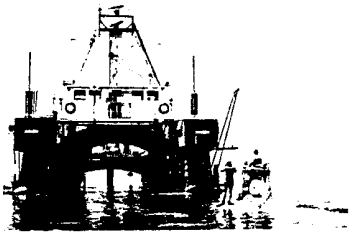
WHOI was chartered in 1930 as a private nonprofit organization for ocean research. It has over 1000 employees now, with thirty buildings and thirteen research vessels. The more notable vessels are the Knorr, Oceanus, Atlantis II, Asterias, and Alvin/Lulu, the famous deep submergence research vehicle that recovered the lost H-bomb off the coast of Spain in 1966. I've reprinted info from the WHOI pamphlets on them below. Recently the institution outgrew its downtown location and built the Clark laboratory 1.5 miles north of town for extra room. It now accompanies Smith, Redfield, and Bigelow labs.

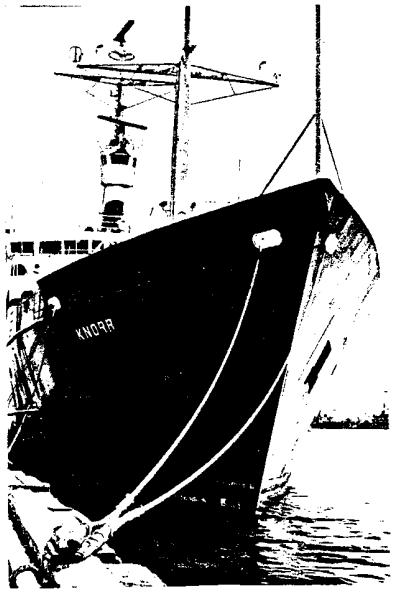
The picture above was stolen out of a pamphlet on Woods Hole. The docks at the upper right are for the Steamship Authority - the ferry service to Nantucket and Martha's Vineyard. If you look closely you can see the channel leading into Eel Pond. The drawbridge is on the main street (Water Street). The WHOI dock (Iselin Pier) is located just west of the channel. The Marine Biological Laboratory is the large grouping of buildings below and to the left of Eel Pond.

The DSRV Alvin is currently in the Pacific working on the hot vents projects. For info on what it's doing, catch the Nat'l. Geographic special "Dive to the Edge of Creation. Alvin will not return to WHOI until August 18-23, 1982. If you're here when it does, I might even be able to get you inside for a quick peek - but no guarantees. I haven't even been inside myself yet.









OUR RESEARCH VESSELS

ATLANTIS II: Length, 64 meters (210 feet) — 2,300 long tons loaded displacement — Crew of 25 — Scientific party of 25 — Range of 15,000 miles at 12 knots — Twin screw diesel propulsion, bow thruster — Built in 1961 under a National Science Foundation (NSF) grant by Maryland Shipbuilding and Drydock Co.

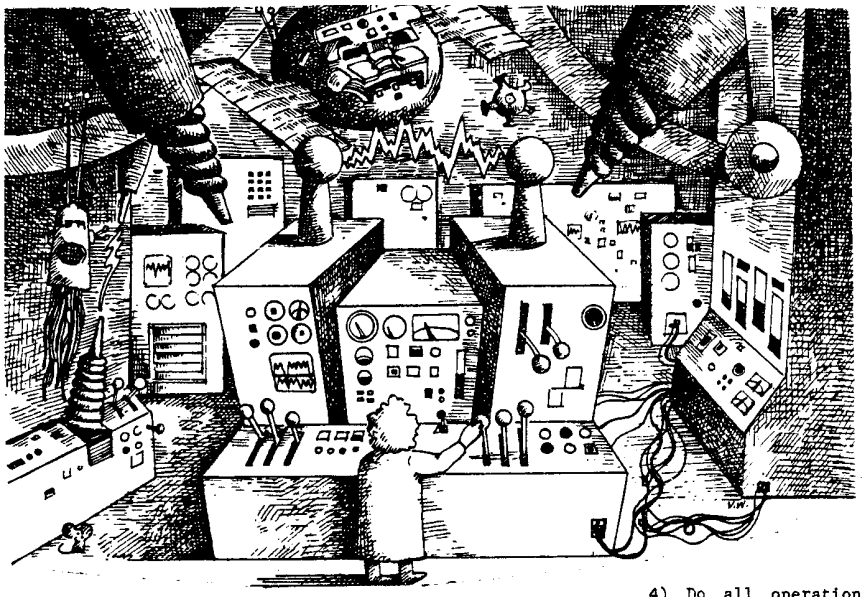
KNORR: Length, 74.6 meters (245 feet) — 1,915 long tons loaded displacement -- Crew of 25 — Scientific party of 24 — Range of 10,000 miles at 11 knots — Diesel propulsion, cycloidal propellers fore and aft — Built in 1969 by Defoe Shipbuilding Inc., owned by the U.S. Navy, operated by W.H.O.I.

ASTERIAS: Length, 14 meters (46 feet) — 20 gross tons — Crew of 1 — Scientific party of 10 (day trips) or 3 (overnight) — Range of 600 miles at 12 knots — Single screw diesel propulsion — Built in 1980 by Newman-Wilbur.

OCEANUS: Length, 54 meters (177 feet) — 962 long tons loaded displacement — Crew of 12 — Scientific party of 12 — Range of 7,500 miles at 12.5 knots — Single screw diesel propulsion, variable pitch propeller, Cort nozzle, bow thruster — Built in 1975 by Peterson Builders, Inc., owned by NSF, operated by W.H.O.I.

ALVIN: 7.6-meter (25-foot) Deep Submergence Research Vehicle — Accommodates one pilot and two scientific observers — 4,000-meter (13,124-foot) depth capability — Sustained speed of 1 knot for 8 hours — Battery powered—Mechanical arms, underwater photographic equipment, various sampling devices — Built in 1964 for the U.S. Navy, operated by W.H.O.I.

LULU: Catamaran tender for *Alvin* — Length, 32 meters (105 feet) — 460 tons loaded displacement — Crew of 9 — Scientific party of 18 — Range of 2,000 miles at 6.5 knots — Diesel propulsion, 2 Murray and Tregurtha units — Built in 1964 for the U.S. Navy, operated by W.H.O.I.



Notes from the lab:

There are probably many among you who have looked longingly upon the gold plated edge connectors of the circuit boards you were stripping before throwing them away. Before me sits 1/4 ounce (Troy) of that longing brought to fruit. Read on and I shall expound.

When I was working as a technician during the summers of my youth, I chanced upon a place that threw away copious quantities of "STUFF". Many of you have seen some of that stuff sold at hamfests. They also threw out unsaleable items that contained gold plating. I got it into my head that the gold that was being thrown out could be mine, and proceeded to make it so. After two summers of half-heartedly collecting the scrap and saving every gold plated thing that came my way, I found that I had acquired about two liters (dry) of card ends, switch contacts, plated leads, etc..

This past spring I decided to reduce that pile to a more manageable form. I dug out the three liter beaker I had been collecting the scrap in and filled it with muriatic acid (I had to get rid of it and decided to give it a try). It didn't do a thing but stink. Since I didn't feel like going through the hassle of getting the gold back out of the solution (I had opted for the route where everything but the gold is dissolved away), I then had to neutralize the muriatic because mixing it with nitric acid makes Aqua Regia, which will dissolve gold. Once neutralized and washed, I refilled the beaker with nitric acid and let it cook. The acid was quite reactive with the other metals, and set about fizzing loudly and heating up. Having the foresight to set it up outside, I just let the wind take the degassing HNO_3 gas away. When the first batch of nitric had worked itself out, I poured it off and replaced it with fresh. I neutralized and disposed of the spent acid. After a total of three cycles the acid had done its job, and I was left with a slurry in the bottom of the beaker that took two days to dry out.

Once dried, the slurry had to be melted. Consulting with a metallurgist on campus I found out the following: Gold melts at a high temperature, one that a propane torch can't quite reach; for a flux to clean the rest of the junk out of the slurry, a product known as borax glass is needed. I managed to get the borax glass and access to a high temperature kiln, and got some assay crucibles from John McKana's back yard (a wonderous place it is). It took a day to heat the kiln to temperature and six hours to get the gold to melt. The result was dozens of very tiny little gold beads. The problem was that I had to pulverize the cruicible to get them! I now had a mixture of gold and ceramics.

The next try was with a small porcelin cruicible and John's oxyacetalene torch. This resulted in porcelin encased little gold beads! With a hammer and small tweezers I separated the gold, ceramic, and porcelin and resolved to try again. I turned over another assay cruicible and melted down some borax glass with my propane torch to make a sticky green layer on the bottom of the cruicible. Using the cruicible as a high temperature tabletop I placed the small gold beads together and cooked them with the propane torch. Although they reached red heat, they didn't melt. I finally got the propane torch to melt the beads by aiming the bright blue inner portion of the flame just at the top of the beads and parallel to the cruicible base. The flame would then suck extra air in from near the beads and burn hotter. By pushing all the little beads together I got seven large beads and discovered that gold will plate hot iron with the borax flux in a manner similar to silver solder.

The next step was to deplate the gold, so I tried a little mercury amalgamation. I soaked the tip of the iron in a 1/4" inch ball of mercury for several hours to dissolve off the gold, then took the mercury ball outside on the borax laden cruicible base and hit it with the torch. The mercury boiled away and was carried off on a good stiff breeze. The gold left formed a 1/16" dia. ball.

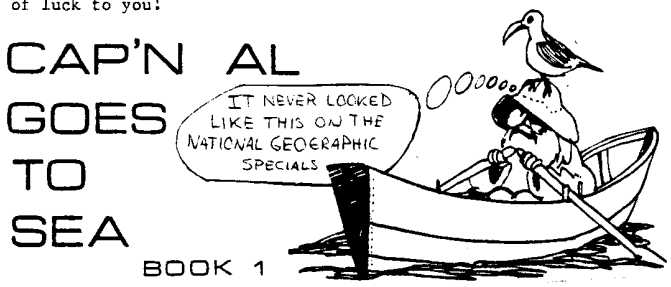
From my experience I would suggest the following for gold recovery:
1) Collect all the gold bearing stuff you can get your hands on. You need a lot to make a little.
2) If the parts are not broken or scored, you must do so. The nitric acid must be able to get underneath the gold to dissolve away the other metals. In two days of work the acid only ate about 1/4" under foil traces on circuit boards.
3) Use only high strength nitric acid. Other acids are a waste of time and money.
4) Do all operations with safety goggles, gloves, and other protective clothing.
5) Nasty gasses come out of the acid when it hits the metals. The worst offender is outgassing HNO_3 that will bind with water again in your lungs, eyes, nose and mouth with most unpleasant results. "Adequate" ventilation means a constant breeze to blow away the gasses. I suggest doing it outside - away from people and things.
6) The acid produces heat when it reacts with the metals. The beaker or container may get too hot to touch. Use an appropriate container that won't break (such as Pyrex). Don't do this on a plastic surface that will melt.
7) Keep lots of water handy to dilute the acid if it spills, and a box or two of baking soda within reach for neutralizing the acid.
8) Use a plastic pair of tweezers to get out pieces of circuit board once the gold sloughs off.
9) When disposing of spent acid, remember that there are copper, lead, and other poisonous metals in solution. Don't just pour it down the drain! Neutralize the acid with a solution of (or dry) sodium or potassium hydroxide (Drano works) which will precipitate the metals. Pour off the remaining salt solution and dry the sludge for proper disposal (I sealed the sludge in a plastic bottle and then threw it out - not really a lot better solution but it will take much longer to get into anyone's water supply).
10) Once you have a gold sludge, dry it and go over it with a magnet and tweezers to get rid of the pieces of undissolved leads, fiberglass board chips and other large, noticeable garbage.
11) If you can't find borax glass (and you probably won't) make some by melting common borax powder until it turns into a greenish glass. If you use the powder as is, it will foam up as the water escapes and carry the gold sluge everywhere!
12) The type of container or surface you use for melting the gold will depend largely on what you can scrounge. A hard, non-porous ceramic is best. It should not soften under orange heat and should be thin enough that it will not conduct heat away too rapidly. Pre-coat the surface with borax glass. This will reduce but probably not eliminate the problems of gold sticking to the surface. I don't know of any way to prevent the flux from sticking to the surface.
13) Propane may not be hot enough but oxy-propane or micronox-butane will be hot enough to melt the gold. I found oxy-acetylene too hot to control. The gold will melt at a good orange heat. Unless the flame is hot enough to make the entire pool of borax liquid (it's still quite viscous under just propane heat), the gold will come together into very small spheres which must be pushed together. I don't know what to suggest here other than a high temperature ceramic rod or graphite rod, though the graphite rod would probably burn and contaminate the flux even more. A small metal rod will work but you must be careful to push the borax and try to coax the balls together. If you touch the gold it may plate the rod. Titanium might be interesting to try!
14) Once the gold has collected into larger balls you will find that the flux is incredibly dirty. While cooling the mix, scrape it off the surface you are working on after the gold hardens but before the flux does. Let it cool the rest of the way, then crush the flux away from the gold with a pair of pliers. Try not to lose any of the gold! I did this inside of a plastic bag to prevent the pieces from flying. A mortar and pestle also works quite well but the gold smears onto the sides. The mix can be kept wet to prevent it from flying too much.
15) Reflux and remelt. Try to collect the gold into balls as big as possible. Cool and crack the balls free. You will probably have to do this several times until the flux does not get very dirty, indicating that the impurities have been removed. The flux may turn brown if you overheat it too much, but I didn't have this problem.
16) Stare at the pretty yellow balls.
17) Put them in a small bottle before you drop them on the floor and they roll down the furnace vent.

You now have some fairly pure stuff that you can make jewelry or a gold plating pen with. There are probably trace quantities of other materials that nitric doesn't affect mixed in. I don't know what they may be. If you have enough you may wish to have it assayed or send it to a refinery for further purification. Ultra high purity is expensive for the home hobbyist to achieve.

You can probably expect to spend 6-8 hours over a two day period doing this stuff. The nitric acid should sit for quite a while to work itself out. The hardest part of the whole operation is getting the nitric acid. Your best bet is probably a rock shop. The nitric is used for cleaning copper specimens. Pharmacies rarely carry the stuff. Local universities, labs or hardware stores may also be a possible source.

I don't recommend the mercury amalgam method. The mercury is expensive and the distillation equipment is expensive for a closed system. The stuff is very toxic and not nice at high temperatures. Cyanide stripping systems which dissolve the gold are also best left to the big specialized operations. For a while I was worried about oxidizing the gold but that turned out to not be a problem. The oxy-acetelene didn't burn it much, and the propane seemed to have no effect whatsoever.

All in all it was lots of fun. I got 1/4 ounce of gold after I was done and I know I lost at least 20% of the starting amount because of the experimenting I did, dropping tiny balls of gold, and the problem of the gold sticking to the assay cruicible walls. Go to it and best of luck to you!



Sunday, Oct. 4 I am approached by the powers that be.

For the past few weeks we have been working fervently on the LDV to get it ready for its scheduled cruise test. The problems have been falling by the wayside revealing larger problems looming in the distance. We have been putting in 15 hour days in the lab, squinting when we venture out into the unaccustomed sunlight. We have gotten to know the folks across the street in the food store so well that they are giving us the extra donuts left in the evenings free! Sandy is talking to Yogi, pointing my way, and muttering words like "indispensable" and "good experience".

At 5p.m. I am busy giving the instrument a test in the Cold Room to make sure that the switching regulator will self start and fire up the laser tube at temperatures below freezing. The bottom of the ocean is cold and that is where the instrument must work. The cold climate of Houghton has prepared me well for the lengthy stay in the test chamber. Yogi walks in and casually announces that I will be going on the cruise Tuesday can I be ready Thank You. Taking care not to look too enthusiastic I reply that I will and maybe even the LDV will.

With the cold test completed, we move on to a mechanical problem which has been plaguing us which causes the delicate optical system to become mis-aligned when we put the instrument into its pressure housing. After letting the instrument warm up, we must move it into a vertical position to align the optics. Working in the Buoy Lab which has the only hoist we can use, we can raise the $160,000.00 instrument end-up using rope, block and tackle. Since the instrument is 7 feet long and the hoist only has a range of 12 feet we must lower it back to horizontal and hand move it whenever we want to insert or remove it from its pressure case. Being very careful not to bang the 6 inch diameter optical glass pressure window on the end of the instrument (which cannot distort when exposed to pressures of 8000 psi on the outside, 14.7 psi on the inside....), we slide it into the pressure housing. Then it's over to the hoist and lift the whole 200 lb. assembly up to a vertical position with its big glass eye three feet off the floor. We power it up and the regulators in the power supply go up in smoke, so it's back down to horizontal and another hour blown away while we fix the problem. Once back up in the vertical position, we take our special Field Use Beam Alignment Test Apparatus (a three inch piece of black electrical tape held in the beam path) and find that the instrument is out of alignment once again.

It is now midnight Sunday, and a quick bit of utilization of the Bell System reveals that the only restaurant open in a ten mile radius is a Dunkin Donuts. Disgusted, Bill dissapears out the back door and returns minutes later with quantities of ham, cheese, bread and tomatos that he appropriated from the galley of the R/V Oceanus. We munch down while waiting for a mad steward to come charging through the door, meat cleaver in hand. Several cups of coffee later, a decision is made to separate the pressure housing from the instrument proper in an attempt to find out where the stress is being generated - while the unit is in a vertical position. After codgering up a base out of buoy repair stands, we set the unit down, and release the pressure housing. When we slide the housing up a few inches, the beams come back into alignment! A little more eyeballing, confirmed by a 4' straightedge shows that one of the Delrin plastic spacers that holds the instrument in the center of the pressure housing is 15/1000 of an inch off center. A little not-so-precise machining with a belt sander solves the problem. We leave at 3 a.m. for some sleep. While on my way to the parking lot a skunk walks along the sidewalk across the street, right past the Post Office. Where else but downtown Woods Hole?

Monday, Oct. 5 Down to the Sea With Chips

Yogi, our beef-eating Hindu, is in at 9 a.m. to make arrangements for a last minute test of the battery/data recorder pressure housing. In at 10 I haul it up to the pressure test facility only to discover that it is too big to fit into the pressure test chamber. We decide to clamp the housing onto an experiment that is being sent to the bottom of the ocean early in the cruise, testing the housing at sea. Back at the lab we place the LDV in its "coffin", a foam lined shipping crate. Frantic running around is the order of the day, locating equipment and gear, sealing it all in waterproof plastic bags (more for the trip to the ship than the trip on it), and packing it into crates. I work at the drafting table updating the documentation to include the changes of the past two days. Finally, at 6:30, everything is done and we finish loading the pickups. We leave for dinner and will meet again at 9 for the trip to the University of Rhode Island.

Everyone is running late, so I get to watch all of the Raiders of the Lost Ark stunt FX special. At 10, the car finally comes by to pick me up and we embark on the two hour drive to the R/V Endeavor. The Endeavor had stopped at WHOI last Friday but stayed only long enough to pick up some tripods too large to ship down to their dock by truck - and got stuck in the channel while leaving WHOI. We joke about it on the way down and decide not to mention anything about it once onboard ship, lest we be "lost at sea". Upon arriving at the dock, we reset our watches to readout in military time. It is now 2345. I have been informed that time doesn't really mean anything on a research cruise with its odd hours, so why not use something really useless to define it? We transfer all our gear to the lab aboard ship. On the way to my cabin I notice a memo taped to the wall regarding recovery of an instrument known as "Triffid". Words like "dangerous", "Lithium cells", "SO_2 release", and "explosive degassing" figure promiflently in it. I recall that Triffid is one of the experiments that the cruise is dealing with. Several questions begin to form in my head, but they are shoved aside by the joy of being able to sleep. I set my watch to wake me at 0630. My spirits are still high, and I have not yet gotten seasick. We leave the dock at 0830.

Tuesday, Oct. 6 I confront the all-consuming fear

At 0630, my watch explodes into life. My years in college have finally paid off. Reflexes developed from years of sleeping in lofts take over, and I manage to not hit my head on the low ceiling. I leap (very slowly) out of bed and get dresed, ready for an exciting day of shipboard romance and adventure on the high seas. Then I find out that all the crew and scientific staff are men, and that pirate ships don't usually attack oceanographic vessels. My only hope lies in finding a lonely mermaid out in the Atlantic 400 miles southeast of Nova Scotia.

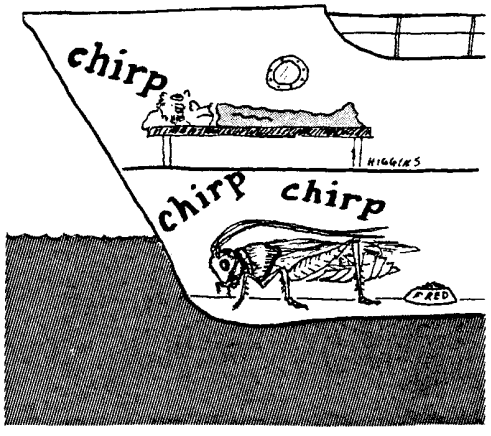
We are underway at 0830, having finished breakfast but not equipment tiedown. Luckily the sea is calm. Nonetheless, taking the assembled LDV out of its coffin, a heavy task on solid ground, provides some excitement on a rolling ship. By 1100, all the gear is tied down, and everyone musters in the main lab. I find out why I am really on the cruise - I am assigned the 3 to 6 watch - both a.m. and p.m.. I have been terrified that I will become seasick and die, or worse yet lose face and be forever barred from working in zero-gee in orbit. The added smells of the chart recorder will make the test even harder.

At 1230 the fire drill we were warned about occurs. There is no pretty stewardess out on the bridgedeck, just a grungy deckhand showing us the latest in offshore survival fashions - a fancy orange foam Dr. Dentons' that will keep you afloat and warm until a Russian trawler can pick you up and interrogate you. Afterwards I go below for a short nap and end up sleeping till 1715. A steak dinner follows, and then minor work prepping the LDV and battery/data recorder housings for their ride to the bottom on the stereo camera tripod. Watch starts at 0300, so I hit the hay at 2100.

Wednesday, Oct. 7

I have not been able to get to sleep. I am not seasick - there is a 500 lb cricket in the bilge the the crew has trained to chirp at 3.5 KHz. He does so every second, and very loudly. They are using him as a depth sounder. That I cannot fall asleep even with this racket amazes me, considering the lack of sleep I have been experiencing in the last few weeks. I drag myself out of bed at 0200 and take advantage of "night lunch" a selection of cold cuts and cheese left in the fridge by the steward, Tony (who is also a Baptist minister and drives a black souped up van with carpeting all over the inside). Sandy is still awake and informs me that he finally got the BASS camera's strobe working by dumping the insulating oil out of the strobe head from around the flash tube. He doesn't understand why either, but it still works even after being stuck in the ship's freezer for two hours (such elegance!), so he's satisfied that his life is worth living and heads off for bed.

BASS, which stands for Benthic Acoustic Stress Sensor is the experiment he has been working on. It uses sets of piezoelectric transducers which fire pulses of sound at each other and determines the current by analyzing the doppler shifts in the frequency of the pulses received. Since it has a cage to support the transducers, it is more invasive than the LDV, but it does give all three dimensions of the current flow. The camera is being sent to verify certain information that the BASS reads. Benthic is a term referring to the bottom of a body of water, and the HEBBLE (HIgh Energy Benthic Boundary Layer Experiments) of which both BASS and LDV are a part deals with the flow and interactions down near the bottom.



I report for watch duty 15 minutes early and learn how to: write LORAN numbers down in a log book; monitor the depth sounder which prints out on a chart recorder that burns a special paper with high voltage; keep absent-minded scientists from going out on deck alone; and be properly bored. Luckily, I have years of complex theoretical engineering training that have prepared me to do just that. At 0740 Zulu (Greenwich Mean Time), 0340 local, the line on the chart recorder goes off the bottom. Unsure of exactly what to do, I get the watchmaster out of the library. He informes me that it is nothing to worry about, we've just fallen off the continental shelf. We crank up the power to the 500 lb. cricket, and I go get another cup of the ship's excellent coffee. The lab is quiet. The HP disk drive does not shake like a washing machine like the DEC drive on MTU's PDP-11. There are no rats crawling down the hall. I am frustrated because there is a Trash-80 staring at me with its phosphor eye and I have no idea of how to use it. By the end of my watch I am most of the way through a large paperback.

Thursday, Oct. 8.....The All-Consuming Fear Consumes Me

Seas are anything but calm. All night we have been operating through a storm. I get up after lunch, in time to participate in the retrieval of the stereo camera tripod with the pressure cases for the LDV. The cases were sent down empty for testing. We hope that the glass window on the front of the LDV case survived as well on the end of the pressure case as it did in the lab tests. The winch slows down as the camera gets to within 200 meters of the surface. When it gets to 120 meters from the surface, the pinger , a device which puts out 12.1 KHz blips for tracking and depth finding, comes out of the water. The winch has about 2000 lbs. of tension at this point. The winch keeps going, the operator seemingly oblivious to the shouting for him to stop.

As the pinger hits the main pulley people start running for cover. The winch is lugging down, and has about 20,000 lbs. of tension now. If the 5/8" steel cable breaks, it's going to make one helluva mess. I find that I have quite intelligent automatic reflexes which, ignoring the definition of dignity, have sent me sprawling into a somewhat protected area. The winch stops with a "fump!", and the pressure releases. People start getting up. But the costly pinger is nowhere in sight. The opinion voiced is that the pinger clamp broke before the cable, and that the pinger is on a 1-way trip back to the bottom. The order is given, and the winch starts up again slowly, with a shiny spot where the pinger clamp used to be on the cable. Moments later, the stereo camera appears, with the pinger on top of it! Apparently the clamp only stripped its threads and slid down the wire. A line is gotten onto it just in case, and the camera assembly is brought on board with much bumping and smashing.

The LDV pressure cases are ok, but while removing the main LDV case, it is dropped on one of its underwater connectors. 3 pins bend sharply, but none are broken off. We have no spare connectors, either here or at WHOI. The spares we had were used because two of the original connectors were faulty. We move the cases back to our lab where we straighten out the pins very carefully. They hold but are now extremely fragile. When the endcaps come off the pressure case we find no trace of water leakage; the optical window is in perfect shape. We load the instruments into the cases for their deployment tomorrow.

My worst fears have been realized. I got seasick and did a technicolor yawn (got that one off of the Preppie Drinking Towel in Spencer Gifts). I quickly hide the terror of thoughts of being unsuitable for space behind hopes that the seasickness won't last. After all, the ship is being buffeted by 20 foot waves and 40 mph winds - with the result that we're getting some nasty 35° rolls. And that chart recorder gives off a mixture of ozone and burned paper that is something just the other side of unbearable. Now it's time for my afternoon watch and I have to put up with it again. But this time I sit on the other side of the lab and walk over to the chart recorder when I have to take readings. It's more hassle but I feel less sick.

Fri. & Sat., Oct. 9 & 10...In Which a Triffid Tries to Take My Life

It's time for my morning watch - again. My seasickness has passed! I've only gotten 4 hours of sleep since my last watch because they're deploying the stereo camera on the winch for another few pictures. The winch, you see, is hydraulically powered. The pump for the hydraulic power is belowdecks, just down the hall from my cabin. It sounds like a loud, sick, moaning cow.

At 0900 we start doing the final mounting of the LDV to the BASS tripod - the instruments go down together. As Bill hooks up the cable from the main LDV case to the data recorder, one of the pins that was damaged breaks off. We take the LDV off the tripod and carry it back indoors, tempted by the deep water so near. Just one small slip and our problems would be over - for a short time, at least! It turns out that we won't have to scrub the launch after all. We have a bypass grounding line on the connector to reduce noise which is not being used in this set of experiments. In half an hour I have all the wiring rerouted. We very carefully put the connecting cable on between the housings and carry the entire assemblage out to the tripod to remount it. A quick test on the tripod shows that all is in operational order. Now we sit back, relax, and try to think of what we forgot.

Meanwhile, a mooring for Florida State University has been sent an acoustic command to release and come to the surface. It's been down for a year, but comes back in perfect shape. A large freighter passes off the starboard (right) side about 1 klick in the distance.

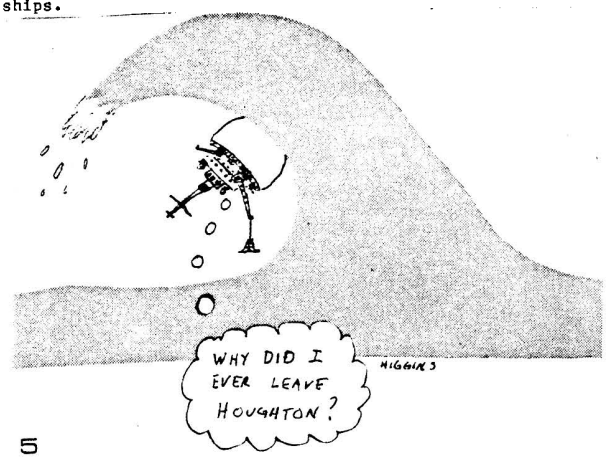
At 0130 we hook the BASS/LDV tripod onto the crane (a Pettibone, no less, for all you yoopers!) and it is lifted off the deck. As it is being swung out over the side, a wave pitches the ship and the corner by me hits the railing. A quick view of the steel toed boots I couldn't get in time flashes through my mind as the 100 lb. chunk of plate steel ballast on this corner breaks its welds and falls. It hits the rail canted, though, and falls overboard. We haul the tripod back down, lash it in place, and proceed to mount a new foot. Properly ballasted, it's in the water an sinking towards the bottom at about 1.5 meters/sec. at 0215. An hour and a half later it's on the bottom, 4850 meters down.

Another deployment of the stereo camera takes up the rest of the afternoon and evening, and another watch goes by. This time the camera does a bounce set of pictures. With the ship moving, the winch is payed out and the camera hits bottom, waits a few seconds, and shoots a picture before being jerked off the bottom as the winch starts pulling again. With the ship in motion, the camera gets shots of the bottom a few hundred meters apart. The camera comes back on board at 8p.m. with no problems and we head back to pickup BASS. Having lifted off the bottom automatically at 1815, it should be back on the surface by now. I end up running between the watch station with the radio direction finder and the bridgedeck with binoculars to try and locate the instrument. Meanwhile, the waves have grown and the rain has started to fall. We finally spot the Xenon strobe on it flashing far off in the distance and pull alongside at 2300. By 2315 it's on deck and tied down securely and people are in the process of preparing the Triffid for launching. We will recover another Triffid that has been at on the bottom for a year in a few days. Bill is heading up the ladder to remove the data recorder from the LDV when I point out to him that they are launching the Triffid and preparing to hoist it off the deck next to him. He scrambles down quickly.

The first step in launching the Triffid mooring is the dumping overboard of a series of glass ball floats. The glass balls provide the buoyancy needed to hold an instrument string above the lander. They are also used to provide buoyancy to lift the lander back to the surface when the ballast tripod is released. The balls are about 18 inches in diameter and housed inside plastic coverings to protect them from damage on deck. Because glass has tremendous strength when it is in even compression, they usually don't break unless they go below 8000 meters. With the string of balls in the water, the lines are hooked on to lift the Triffid lander off the deck. The main line is a 3/4" rope and there are two 1/2" ropes used to prevent the lander from swinging once it is in the air. The last rope is a 3/8" line connected to the release hook. The chief scientist hands it to me and tells me to make sure that I keep the rope slack so that the lander doesn't release itself and come crashing down on the deck. At 2330 the crane goes into action and starts lifting the lander off the deck. The current meter that goes between the lander and the glass ball flotation string is still on deck and will be lowered into the water after the lander is over the side and ready to be released. It is acting like an anchor for the lander as the lander starts to gently swing with the motion of the ship.

There are a total of six of us on the fantail doing the launching, and Bill, Yogi, and Sandy are watching from inside the main lab. They get to stay out of the spray and keep dry! With a sudden "twang", one of the half-inch lines separates and the lander starts swinging a little more. Several of the deck hands try and get more lines onto it to stop the swinging. A large swell hits the ship, and like a kid pumping on a swing Triffid heads out over the side. The remaining 1/2" line is pulled away from the deckhand controlling it, and Triffid is swinging free. It weighs about 2000 lbs..... People start heading for cover, very fast. The deckhand controlling the vertical line and I are the only ones left holding onto any rope. Triffid is about 6 feet off the deck and heading out over the rail on the side from which it was supposed to be launched from. It is pulling the 150 lb. curent meter around the deck like it was made of styrofoam. As it approaches the end of its swing, I pull the release as hard as I can to try and dump the thing. No good. This type of release is harder to operate the heavier the load on it. Another swell raises the bow of the ship and Triffid swings across and back. Very quickly remembering pendulum response from physics lab (bless you Prof. Chimino) I realize that I am going to get a somewhat more than gentle peck on the cheek if I don't move. I now have enough adrenalin pumping through me to punch through the steel deck if I need to but instead I reach 0.9C getting out of the way (this figure is from reliable witnesses observing at the time). The deckhand at the windlass lets go the line and ducks behind the windlass, and Triffid comes in low and heavy and clobbers the railing. It's still sliding around on deck so we grab line and race to secure it before it crushes something else.

Silence reigns. My life has not flashed before my eyes even though I have been closer to death than ever before. My time sense has doubled or tripled. My watch is running incredibly slow. I notice a buzzing in my ears, and am not surprised to find that it is my heartbeat. The only other sound on deck is that of the waves breaking over the fantail. We quickly check to make sure that there are no injuries. Miraculously, everyone is OK. The deckhand who was on the windlass tries to drag us back to reality and asks if anyone has any toilet paper. The joke brings us back, if only partway. Less than 30 seconds have elapsed since the rope broke. I haven't slept for 25 hours but I couldn't sleep now if it had been a week. Sandy remarks that he hasn't seen anything that wild in ten years on ships.



At 0030, Bill goes up the LDV tripod and gets the data recorder down. We plug it into the reader and discover clock pulses but no data. The LDV case is horribly corroded on the surface. Several of the batteries have started to leak electrolyte. Yogi and Bill decide to wait until we return to shore to do a problem analysis - they don't wan't to fix the problem without knowing exactly what it was, and want the greater resources available in the lab at WHOI.

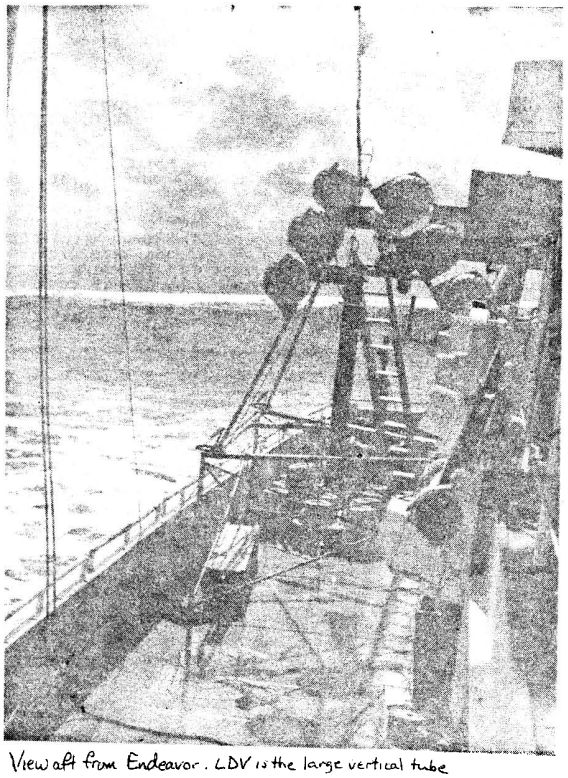
The box core sample unit is sent down to the bottom at 0130 to retrieve 2 cu. ft. of the bottom. At 0330 the winch wire comes back, frayed and stretched without the sample unit. We work readying the BASS tripod for its second launch, this time without the LDV. At 0600 my watch ends and I head for my bunk, utterly exausted. I have warned the person doing the watch prior to mine that he will have to come get me. I do not expect to be able to muster enough strength to hear my alarm go off. He shows up a few minutes before 3 and wakes me. I crawl upstairs and meet Sandy, smiling and full of energy. It doesn't make me feel better at all. I barely make it through my watch and stumble back down to sleep once again.

Sunday, Oct. 11 Neptune takes a Holiday

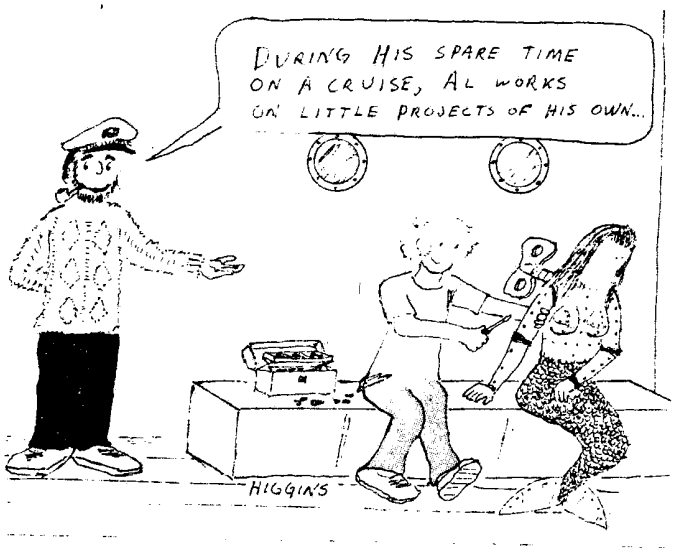
I feel much better as I rise for my 3 a.m. watch. When I get back upstairs I fingd my boss still awake. BASS (his experiment) has been on its second deployment since 0900 yesterday. It should have released itself from the bottom half an hour ago, but we haven't been able to locate its acoustic pinger yet. Checking the LORAN C positions we notice that we have drifted a good distance away. Once the ship returns to the proper area we pick up the pinger. The weather has finally calmed down, and the waves are only a six feet high.

I am given the task of directing the ship for recovery of the unit! The chart recorder at the watch station scans every second. The pinger on the BASS tripod pings every second. As the distance between the ship and BASS decreases, we experience a doppler shift in the time between BASS pings (I am beginning to think that all oceanography depends on doppler shifts). This results in a sloping line on the chart recorder, where the slope of the line is the reciprocal of the approach speed. Nifty! I have to box in the BASS by waiting until the line is vertical and then giving the bridge instructions to change the direction of the ships travel. The object is to keep a minimum slope line (with the correct polarity, of course!) plotting on the chart recorder. This I take as a challenge, having done nothing of real importance on this watch other than finish an SF novel. Once BASS is on the surface we will rely on the radio directon finder and binoculars.

Around 0400 the signal dissappears from the chart recorder. This should mean that BASS is on the surface. We have done three boxing turns with the ship, and figure that we should be within 2 km. of it. The direction finder is going but we aren't receiving any signals. We call the bridge to ask if they can see it and are told that it showed up a few moments earlier 100 meters away. It turns out that the channel select knob on the direction finder had been twisted and no longer shows the correct channel! People are starting to converge on the fantail for the recovery of the tripod. We realize that we are alongside when we hear a bang from the railing and see the top of the tripod peeking over the side. Lines are secured but when we start lifting, two of the three support beams snap. There is one piece of angle aluminum holding the tripod together. If it breaks the glass flotation spheres will stay here and the instrument will go there. Great care is taken in getting extra lines on before that happens without losing any limbs. We finally get the shaky tripod on deck and remove the equipment from it in the gathering dawn.



View aft from Endeavor. LDV is the large vertical tube



The decision is reached during the day to end the cruise a day early. We will not attempt to grapple for Triffid 1 (launched over a year ago but lost when the last ship attempted to recover it). The BASS tripod is useless now, and we haven't been able to figure out what has gone wrong with the LDV. Our spirits are lifted by an excellent dinner of prime rib au jus, baked potatoe & squash, salad and strawberry shortcake. We inquire as to whether Tony would like to sign on as steward with WHOI ships. The end of cruise party that evening is quiet, but I throw in a few SF verses of "Mama don't allow..." anyway. Now there is nothing to do but wait until the ship docks again.

Monday, Oct. 12

We pull into port in the afternoon. I notice that Terra isn't as firma as I thought. It keeps moving just like the deck of the ship. Obviously I just never noticed it before.

It is Columbus Day, a holiday out east, and we can't get ahold of anyone at WHOI to come get us. There is a rumor that someone is coming (the chief scientist walked through the main lab muttering "yup, yup, everybody's got vans coming"), but we cannot confirm it. By 6 p.m. we are tired of waiting, so Jim the messman offers to drive us to our doorsteps for $10 apiece. We agree and seven of us pile into his Cutlass. We can't all fit sitting, so Yogi lays across our laps. Exhaust is coming in through the trunk and it is cold outside. It was much warmer out in the Gulf Stream! ~~We~~ have to keep the windows open all the way back to Woods Hole. The next day we find out that a van and truck came down for us but we had already left! They got lost on the way and got there an hour late. All in all it's an experience well worth going through. I decide to start looking for another cruise to go on sometime soon!

Epilogue:

The LDV was found to have a connector that scraped through the anodizing inside of the case and put it at -25v potential. The endcaps were at ground potential. With seawater as a conductor, the electrolytic action corroded the case and dropped the battery voltage too low for the circuits to operate.
The cameras made beautiful pictures of the silty ocean floor.
BASS produced the results that it was supposed to, but future funding is being cut anyway.

Sinclair Research Beats Its Own Record With ZX81 At Under $100

BOSTON — Not content to rest on its laurels, Sinclair Research has obsoleted the first microcomputer to sell for under $200—its own ZX80. The company has introduced the ZX81 microcomputer which sells for $99.95 in kit form ($149.95 ready to run). And the ZX81 isn't just a price-cut version of the former low-cost champ.

The new micro features an innovative design that uses only four chips, rather than the 21 chips needed by the ZX80. Eighteen of the ZX80's chips are replaced by a single custom-LSI chip made in Britain for Sinclair by Ferranti. And this custom "master chip" adds new features to the old ZX80 design.

New features of the ZX81 include the ability to operate in two software-selectable modes, Fast and Normal. The Fast mode is four times the speed of Normal. In the Normal operating mode the ZX81 computes and displays data simultaneously. This new operating mode overcomes the rather disconcerting screen blanking of the ZX80 when running a program.

The 8-kbyte Basic in ROM has been upgraded as well. Numbers in the ZX81 are stored as five data bytes in a floating-point format. The range is $\pm 3 \times 10^{-39}$ to $\pm 7 \times 10^{38}$, accurate to 9-1/2 decimal digits. Basic-language features include full log, trig and inverse-trig functions and the ability to handle multi-dimensional numeric and string arrays.

The ZX81 retains the membrane keyboard of the ZX80. This shifted-key design uses 40 keys to give the equivalent of 91 keys by the use of a function mode and Sinclair's single-press Basic key-word scheme. A graphics mode adds 20 graphics characters and 54 inverse-video characters that can be keyboard entered.

The display can also be divided into a 64 × 44 pixel graphics format. Each of the pixels can be "blacked" in using a PLOT command or "whited" out with the UNPLOT command under program control.

Other retained features of the ZX80 include program editing, automatic syntax checking as each program line is entered, a 24-line by 32-character display format and 1 kbyte of built-in RAM. Programs are loaded and saved on a regular audio-cassette tape machine. Programs can be stored and loaded by name; the ZX81 will search through a tape for the required program. The video display is by means of a regular monochrome TV set. A built-in rf modulator dirves the TV.

Sinclair Research has again garnered the laurels for the least-expensive microcomputer in the world. Its under-$100 kit ($149.95 built up) ZX81 is built with only four IC chips. A single Master chip takes the place of 18 of the chips used in the former low-cost champ—Sinclair's ZX80. Weighing a mere 12 ounces, the 6 × 6.5 × 1.5 in. unit uses a standard TV set for display and an audio-cassette recorder for program storage. A 16-kbyte RAM package attaches to the back of the ZX81 to expand the computer's internal 1-kbyte memory.

Accessories for the ZX81 include the previously released $99.95 16-kbyte expansion RAM package. And Sinclair has promised a ZX Printer for under $100. It's expected to be on the U.S. market early in 1982.

The price of the built-up ZX81 is $149.95. In kit form it goes for a mere $99.95. Included in the price is a 164-page operating manual and a self-instruction course in Basic programming. Both versions and the 16-kbyte RAM addon, are available now.

Sinclair Research Ltd., Nashua, NH 03061. (800) 543-3000, in Ohio (800) 582-1364

Circle 151 on Reader Service Card

Latest reports are that there is a 2-month wait for the kits to be delivered for the ZX-81

Regulations and Reality

The decade of the 1970s saw the laser mature in virtually every application. In artistic and entertainment uses there is the potential of millions—perhaps tens of millions—of people being given the opportunity of enjoying some form of artistic, entertainment or architectural event with lasers each week. From a public-health point of view the Class III and Class IV lasers that are used for artistic and entertainment purposes can present significant hazards to the human eye and skin if adequate safeguards are not properly followed. As a result, the Bureau of Radiological Health (BRH) of the federal Food and Drug Administration has published specific policy statements regarding laser-lighting events. The Federal Laser Product Performance Standard limits such demonstration-laser products to a one-milliwatt total beam power. Consequently, those using lasers of more power are required by law to request a variance from the standard. The FDA has ruled that even a single individual who builds a laser-entertainment system in his basement and then offers his services using this equipment is a laser manufacturer and must comply with the regulations as specified in 21 CFR 1040.11(c).

A variance for laser-light shows and devices is generally granted upon determination that the product is required to perform a function not performable with equipment that is in compliance with the standard. The determination must show that suitable means of laser-safety protection will be provided. It should be stressed that the FDA, upon granting a variance, does not endorse or certify the laser-light show or the equipment to be used.

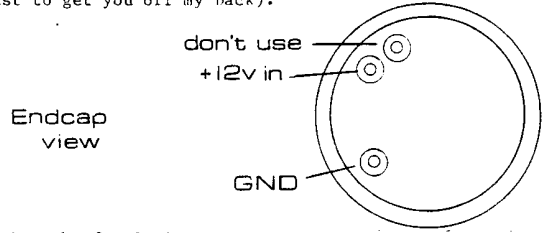
A variance is required for both the source (i.e., the projector and main control system) and the laser-light show itself, including all special effects (such as projection surfaces of screens, remote scanning components, mirror balls, fixed mirrors, and beam terminations) in their final assembled configuration at a given performance site. To obtain a variance, two specific forms must be submitted: "Guide for the Submission of Information on Lasers and Products Containing Lasers Pursuant to 21 CFR 1002.10 and 1002.12" (dated July 1976), for reporting the laser-projection system; and "Reporting Guide for Laser Light Shows and Displays (21 CFR 1002)" (dated March 1980), which is used to report the light show or display. In addition, the Bureau of Radiological Health requires notification of specific dates and locations of all performances. Details of all reporting requirements are included in a recent policy statement, "Clarification of Certain Laser Light Show Requirements" (dated March 31, 1981). This statement is available from the Department of Health and Human Services, FDA, BRH, Rockville, Maryland. Request "Laser Notice No. 29".

LAST WRITES

It may seem strange to put Last Writes on other than the last page, but I've been kind of working from both ends inward and what I put on the back cover fits better there (maybe some postal worker will see it and get a new interest in the space program).

A number of interesting things have happened today as I'm putting this zine to bed. This morning as I awoke and looked out the window, I saw what I consider to be the first real snow all season - the dark ground could not be seen. For a moment I thought I was in Houghton and had to get up to go to classes. Then my senses came to and I remembered that my bedroom in Houghton didn't have a window. On the radio folks were talking about how last weeks storm that Boston got was the worst one in years (I was at sea during it and didn't have the mildest time either). Maybe I brought some of the North Country with me. Has the winter in Houghton been any better this year?

Around 1 I decided to call a techie friend in Michigan that I hadn't talked with for months, and got quite a surprise. What was once shall be again - more laser power supplies have surfaced. The friend was one in the laser industry who while cleaning shop uncovered a hidden cache in a secret corner. There are approximately 30 to 40 more laser supplies that are up for purchase. Those of you who missed out last time can now toss your disappointment out the window. Best of all, the ravages of inflation have not struck. The price is still $20, plus another $4 for delivery through the mails. Delivery is free if you get it from me at a con or berserker. Of course, the next con I'll be at after Windy is Boskone, followed by Minicon, and I won't have the supplies with me at Windy. I may be at Confusion and I have contemplated going to Winter Carny at MTU (theire both on the same weekend). The laser supplies are the same ones as previously sold with the cylindrical silicone potting and the aluminum endplate. I reprint here the input pin configuration as a handy reference. Remember that the high voltage output is the lead going through the resistor and that high voltage ground is connected to the power supply ground. Supplies are sold without warranty but with a promise of lots of help if any problems do show up (I may even replace it just to get you off my back)!



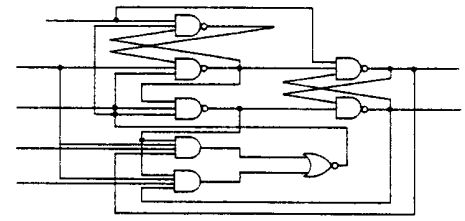
During the final throes of pasteup I was listening to All Things Considered, the NPR news program. It seems that today is the 80th anniversary of Marconi's first radio transmission across the Atlantic. Only eighty years! They also mentioned that Tesla sued Marconi claiming patent rights on radio transmission and won.

Prior to the news there had been a recorded concert with Tom Paxton being broadcast. For a moment I thought that Tom Lehrer was singing once again. Take heed music fans.

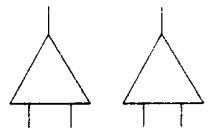
I've got to go now, but I've left the space next column over blank for a reason. I don't have anything else worth printing! Some of you will be getting some personal correspondence in that space - don't feel bad if you don't though, it's not that I don't love you, it's that I have run out of time. Bye for now. 12 December 1981 - Al

This section is devoted to reprinting the neat and interesting articles and data that I have stolen out of the various technical journals I get that I think you folks will be interested in.

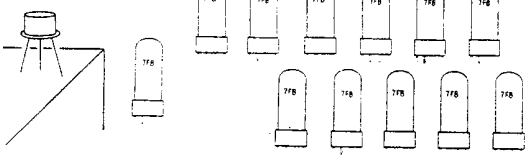
The Component Capers are reprinted from Electronic Products Magazine and are copyright to United Technical Publications.



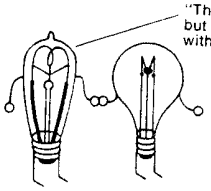
This is the last time you're taking me to a taffy pull!



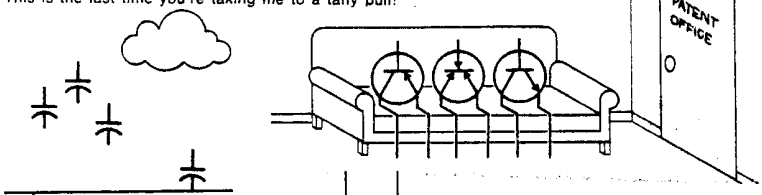
"Your phase is quite familiar but I can't recall your gain."



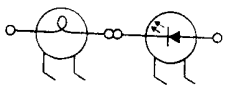
That was a solid presentation, professor, but your theory is still full of holes.

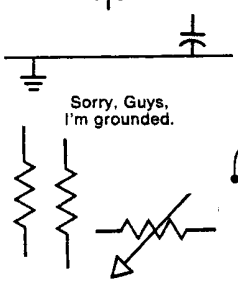


"The lad's bright enough, I suppose, but I wish Lucy would meet someone with a broader spectrum of abilities."

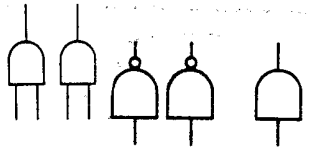


Sorry, Guys, I'm grounded.



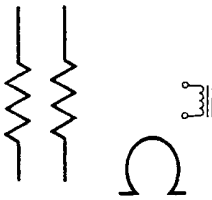


Careful — it could be poisonous.

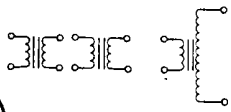


He lost his head over some girl.

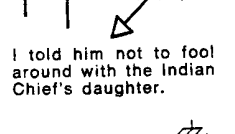
Component Capers



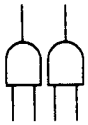
. . says he's from Texas.

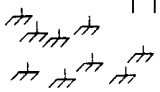


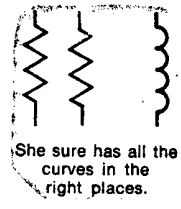
. . . claims his new assignment is quite a step-up!



I told him not to fool around with the Indian Chief's daughter.

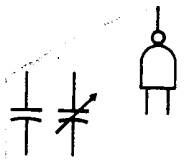




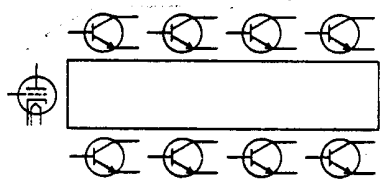


She sure has all the curves in the right places.

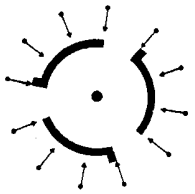
Ugh! Better call the exterminator, Ralph.



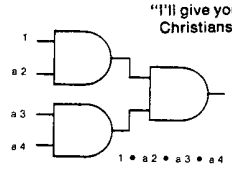
OK William Tell — Do your stuff!



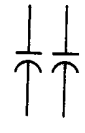
I thought old Ed would never retire.



"I'll give you 12-to-1 odds on the Christians against the Lions."



Lawrence Welk's Downbeat



"He's got a few rough edges, but I think we can smooth them out."

Metallic Panels Would Insulate at 2,700° F

Insulation under development for the Space Shuttle could have other applications.

Langley Research Center, Hampton, Virginia

Multiwall metallic panels now under development as replacements for the ceramic surface-insulation tiles of the Space Shuttle could eventually be used in other aircraft and possibly even as thermal protection in ground-based applications. Various configurations of the basic multilayer sandwich are expected to protect against temperatures ranging from 700° to 2,700° F (370° to 1,480° C). With assistance from heat-pipe cooling, the panels should withstand temperatures to 3,500° F (1,930° C); however, the heat pipes would not exceed 1,600° F (870° C).

A major objective for the new panels is to survive the expected 100-mission lifetime of the Space Shuttle. They should be more durable than the fibrous or ceramic tiles, which have to be carefully monitored for surface fraying, erosion, and cracking. The new metal panels should withstand thermal and mechanical stresses better, without adding to the weight of the vehicle.

Each panel attaches to the primary structure with a bayonet mounting at its corners (see figure). This simple slip joint allows for expansion to relieve thermal stress. Furthermore, each panel is isolated from the strains of the primary structure, with adequate space for thermal expansion and mechanical tolerances. To prevent vibration, felt strips are compressed at the edges of the panels. Each panel is vented to the local static pressure through a hole in the felt strip at the trailing edge on the cooler surface.

The insulating panels have different structures, depending on the local temperature to be encountered. For the temperature range from 700° to 900° F (370° to 480° C), multiwall metal (usually titanium) panels consist of alternating flat and dimpled sheets, joined at dimple crests as shown in the figure. Heat conduction through these panels is minimal because the layers touch only at the dimple crests, resulting in a contact area less than 0.2 percent of the surface area. The long conduction path and low heat conductivity of titanium contribute to the thermal barrier. Radiative heat transfer is inhibited by the multiple layers, each of which is a radiation barrier. Heat transfer by convection is avoided by keeping the cells small. Gaseous conduction can be eliminated by evacuating the cells and sealing them; however, when vented they are weight-competitive with the ceramic tile system.

For the temperature range from 900° to 1,600° F (480° to 870° C), a metallic enclosure supports a fibrous insulating filling. The pressure loads are supported by either an outer foil-gage superalloy dimple-core sandwich or a superalloy honeycomb sandwich and an inner titanium sandwich, joined by beaded edge seals.

For the range from 1,600° to 1,900° F (870° to 1,040° C), the outer sandwich is a superalloy honeycomb sandwich with a thicker facesheet to resist oxidation.

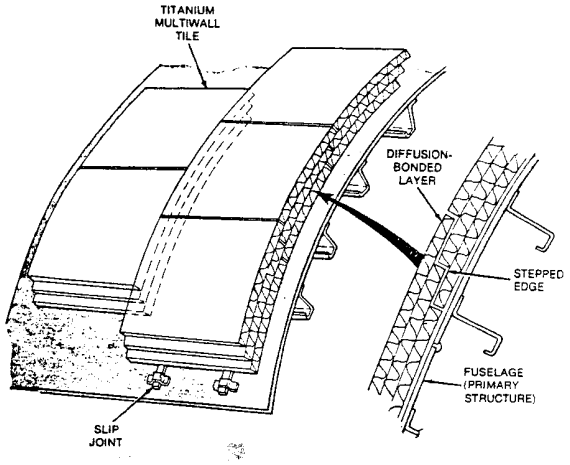
In the range of 1,900° to 2,200° F (1,040° to 1,200° C), the outer layer is a flanged waffle of oxidation-dispersion-strengthened alloy, which has excellent oxidation resistance.

At 2,200° to 2,700° F (1,200° to 1,480° C), the outer layer is a coated refractory-metal-flanged waffle or a rib-stiffened advanced-carbon/carbon panel. While the carbon/carbon is lighter in weight, the refractory metal panels may last longer due to better resistance to damage.

Nickel-alloy heat pipes can be used where localized heating may produce temperatures as high as 3,500° F. The heat pipe would transfer the heat to a large, cooler area, from which it can be radiated; and the heat pipes operate at about 1,600° F for long life.

The basic technology required to produce the panels has been or is being developed, and models have been built. They await large-scale testing of assemblies on representative structures.

This thermal protection system was conceived by L. Robert Jackson of **Langley Research Center.** *For further information, Circle 80 on the TSP Request Card.*



Insulating Panels are attached to a surface to protect the interior from high temperatures. In this illustration, the panels are multiwall in which layers of dimpled foil alternate with smooth ones, forming thousands of small cells within the panel.

NASA Tech Briefs, Spring 1981

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to the Patent Counsel, Langley Research Center [see page A5]. *Refer to LAR-12620.*

First True 3-D Graphics Display Creates Space-Filling Real Image

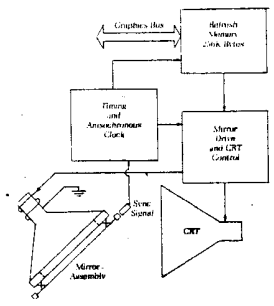
DALLAS — Genisco Computers created quite a stir at the August Siggraph conference here when it flaunted the first commercially available graphics system with a real three-dimensional display. Unlike so-called 3-D displays that give the illusion of depth by showing a perspective view on a CRT, or those that use two images and special viewing glasses, Genisco's SpaceGraph system creates a space-filling object within a volume, not a picture on a flat surface.

An operator sees this 3-D image with a 20 × 25 × 30-cm display volume without special glasses or viewing aids. Since it's a real image—it can be photographed—part of the sides of a displayed object can be seen by looking to either side of center.

The SpaceGraph system creates the 3-D image by reflecting a CRT image off a vibrating, variable-focal-length mirror. As the mirror vibrates, it changes focal length. The timing of the CRT image is synchronized to the mirror position so that sections of the object displayed on the CRT are reflected at progressively deeper positions of the mirror image. The visual-retentive characteristics of the eye fuse the image planes together.

By refreshing the display at a 30-Hz rate, the image appears to be suspended in space. The resulting space-filling display looks natural, curved lines are shown as they appear on a real object and details, like a through hole on a PC-board layout, can be seen through.

The reflecting mirror is much wider (40 cm) than the three-axis display volume (20(X) × 25(Y) × 30(Z) cm). The greater width of the mirror lets the reflected image be viewed at angles up to about 30 degrees from the display's center point. This lets a viewer see some of the sides of an object by moving his head to either side of the center.



The SpaceGraph system elements include a 16-bit computer, program memory, monitor-control logic, the display-refresh memory, along with the mirror assembly, CRT and their control circuitry. System options include a host-computer interface, mass memory and an upgrade of the refresh memory to 1/2 Mbyte.

What Makes It Go

Genisco's system has two operating modes. The graphics mode shows "stick" drawings with vectors and points in a 3-D array like those that are used with CAD (computer-aided design). The second, or image mode, shows actual pictures.

There are only two moving parts in the SpaceGraph display—the mirror and its drive. The driver that vibrates the mirror is simply a hi-fi woofer. Total movement of the mirror at its center is ±2 mm. The position of the vibrating mirror is synchronized with data displayed on the CRT.

For a 3-D graphics image, the display memory is divided into multiple X-Y planes. Each of these X-Y planes is one point along the Z axis (depth). The Z axis is divided into 32,768 time slices with an X-Y memory plane corresponding to each time slice. Display vectors are drawn, and points are shown by illuminating one picture element (in 3-D called a voxel for volume element) per Z-axis plane. This point may be located at any position in the 4096 × 4096 X-Y voxel plane.

Pictures are displayed as a series of planes of data stacked one behind the other along the Z-axis of the display. The size of the memory planes and the number of stacked planes can be selected by the user. The total element capacity of the display volume in the picture mode is 262,144 voxels per display-refresh cycle. The matrix size of each memory plane can vary from 64 × 64 elements, with 64 Z-axis planes, to 256 × 256 with four planes.

In both the graphics and image modes, each voxel of a data plane can be assigned an 8-bit intensity value. A programmable display-intensity table allows real-time selection of any of 128 shades of gray for each voxel. This table can be programmed so that any voxel or group of voxels can be blinked or blanked on command. This lets the user intensify, deintensify or blink any part of the 3-D display for easy recognition.

Combined-Mode Displays

Graphics and image modes can be combined, allowing images, graphics structures and characters to be intermixed on the display. This is done by displaying the graphics vectors and points during the forward stroke of the mirror and by displaying the image during the backstroke.

Driving the display is Genisco's ADC 16-bit computer that's married to a 256-kbyte display-refresh memory (512-kbytes optional). The system-operating programs run from the 128-kbyte main memory. Data are transferred between the computer and the refresh memory over a graphics data bus at word-transfer rates to 3 MHz.

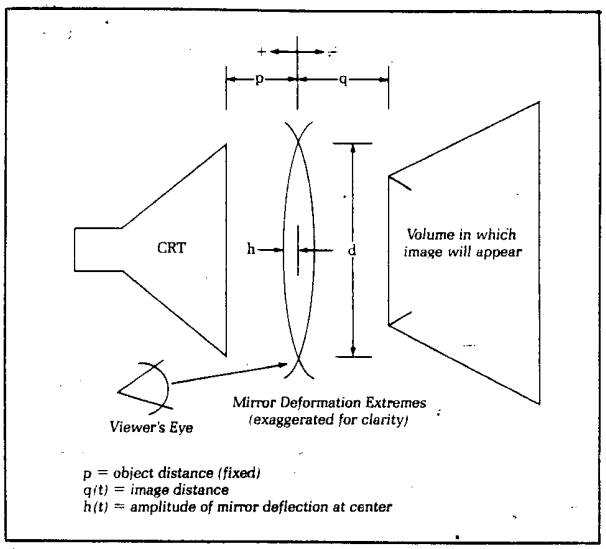
Via the computer, the operator can control any part of the graphics-mode sequence with keyboard commands and can use a wide range of interactive operations. Display vectors, characters and points can be added, deleted, intensified or blinked by use of a three-axis joystick plus keyboard commands.

Software routines supplied for processing the graphics data base include the Siggraph Graphics Standard (CORE). Added functions handle the special features of the SpaceGraph display. Special software routines provide automatic scaling and centering to make maximum use of the display's volume.

First delivery of the SpaceGraph system is slated for the last quarter of this year. The approximate price of a base system is $100.000.

—Phil Koopman

Genisco Computers, Costa Mesa, CA 92626. (714) 556-4916



The SpaceGraph system creates a 3-D image by reflecting a CRT display off of a vibrating, variable-focal-length mirror. The image appears as a series of sections stacked one behind the other along the Z axis (depth). Each section of the displayed object is synchronized to a specific position of the vibrating mirror. The mirror's focal length changes at each position. The image sections reflected from the CRT, while shown on the CRT in equal size, appear larger when close to the viewer and smaller when farther away. The viewer's eye binds these successive images together into a space-filling display.

Electronic Engineering Times

Gallium Nitride LED Emits Blue At 7.5V

CHICAGO — A true blue LED is now being manufactured in Japan as a culmination of years of joint research by Matsushita's Research Institute and Matsushita Electronics Corp. in Osaka.

The world's first commercial blue emitters were demonstrated at Matsushita's Technology Today exhibit at the Consumer Electronics Show, held here earlier this month. The devices use a gallium nitride (GaN) structure and require 7.5 V to operate. While that's substantially higher than the 1.5 to 2.8 V required by gallium phosphide for green and gallium arsenide phosphide for red, it is far below the 20 V or more required for earlier blue LEDs that were based on silicon nitride and silicon sulfide structures.

The higher potential is needed as blue photons require much higher quanta of energy than do conventional red and green wavelengths, and wide-potential bandgap structures are needed to achieve this.

The earlier-researched materials had light-conversion efficiencies of about 0.003 percent—hardly the stuff of beacons.

But in 1978, Matsushita succeeded, experimentally, in using GaN in a metal-insulated semiconductor structure with a GaN insulation layer. Now in production, the resulting material is vapor-phase epitaxially grown on a sapphire substrate, and process yields are high, according to a company spokesman.

The new LED produces more than 2 millicandela with a 10-mA drive, for an overall efficiency of 0.03 percent, 10 times that of previous blue LEDs.

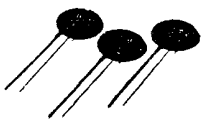
Center-emission wavelength is 590 nm which, when coupled with the light from conventional red and green devices, yields an excellent white, says Matsushita. This has long been an elusive goal of LED matrix-display designers.

The devices will be available soon from a planned addition to Matsushita's U.S. divisions—the Matsushita Electronic Components Co., Ltd.

—Richard Doherty

"SOFT-START" DEVICES

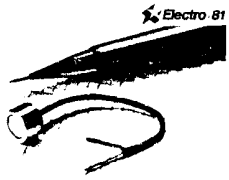
Prevent dangerous inrush currents



"Soft-Start" devices display relatively high resistance to starting currents and, with their negative temperature coefficient of resistance, exhibit a large decrease in resistance when ac or dc current is applied. Unlike circuit breakers and fuses, "Soft-Starts" prevent dangerous, short-duration, peak inrush currents at turn-on. Especially useful in power supplies where charging capacitors initially present extremely low impedance, "Soft-Starts" actually limit inrush currents, thereby extending the life of other critical components. Ratings include Imax of 0.5 to 25 A, R @ 25°C of 1 to 60Ω, and R @ Imax of 0.01 to 1.00Ω. Their body dimensions range from 0.50" to 1.10" in dia. and 0.25" to 0.50" thick. From 45¢ in 1000 qty. Contact Cal-R Inc., 1601 Olympic Blvd., Santa Monica, CA 90404. (213) 450-1761.

SUBMINIATURE

Electret capacitor microphone



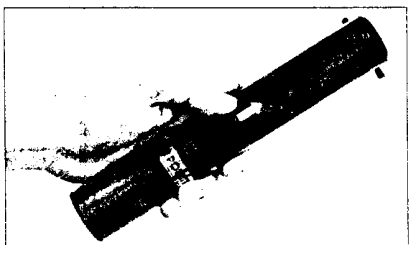
The 3030 Series high-performance subminiature capacitor microphone, designed to meet military standards, is suggested for use in voice applications where intelligibility is of prime concern. Special features are a 6-dB rising frequency response over the voice range. Full weatherproofing, and shock and vibration resistance extend the range of applications. Sound enters through a water-repellant metal screen. The unit includes a highest quality electret and an integral FET preamplifier. Contact Gentex Corp., Electro-Acoustics Group, 5 Tinkham Ave., Derry, NH 03038. (800) 258-3554 or (603) 434-0311.

Look at this! A new toy for the Con Coms to outlaw. Why don't you Chicago people check into this further and find out how legal it is.

Pointer

The Laser Pointer projects a visible bright red spot of light several hundred feet under normal lighting conditions—great for lecturers with slides. The $800 helium-neon laser has an output of 0.5 mW—not enough to harm eyes or body, says RMF Products, Box 413, Batavia, Ill., 60510.

from Popular Science



GE'S LOW-COST FIBER-OPTIC KIT

If you've been wanting to take a crack at fiber-optic data transmission, GE's $9.95 kit may be just the ticket. It comes with a GaAs emitter and a silicon phototransistor detector. Included are applications data and a terminated, 1-m length of DuPont's Crofon plastic-fiber cable. The emitter and detector are housed in similar plastic PC-board mounted cases that are threaded to mate with AMP's Optimate fiber-optic-cable connector. The emitter-output peaks at 940 nm (infra-red) and has a typical rise time of 300 ns and fall time of 200 ns. Typically, with a 2.5-kohm load, the detector turn-on time is 8 μs and turn-off is 50 μs. Your local GE distributor has the kits in stock. For more info, contact General Electric Co., 101 Merritt 7, P.O. Box 5900, Norwalk, CT 06856, (203) 852-8200.

The distributor to contact for this is Arrow Electronics

Flat-Screen TV Readied For Commercial Use

By Avi Kramer

BOSTON — The first commercially viable flat-screen TV has been perfected, according to Sinclair Research, a British electronics firm. Sinclair says the black-and-white set will retail for about $125 and will be available in mid-1982.

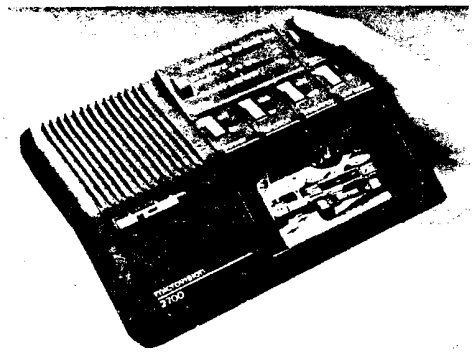
Sinclair builds its flat CRT by "folding" a conventional CRT; the electron source is set to one side of the screen. The axis of the electron optics is parallel to the screen, rather than perpendicular to it. Two sets of electrostatic deflection plates in the source assembly provide horizontal and vertical scanning, while a third set of plates between the phosphor screen and front face bends the electron beam toward the screen.

Without the third set of deflection plates, the angle of beam incidence would vary across the screen, spreading the round beam spot into an ellipse. The focusing electrode is formed on the front face by a transparent tin-oxide coating.

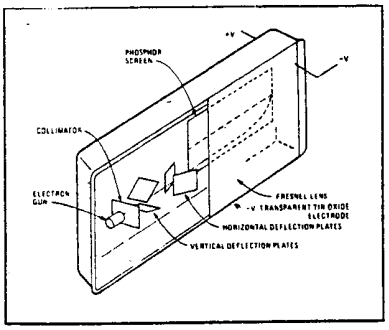
This type of projection system requires several image corrections to be made to compensate for the folded electron optics. Uncorrected, the raster scan would produce a keystone-shaped frame in which the vertical edges are curved and the horizontal edges form the sides of a trapezoid.

To overcome this problem Sinclair reduced the screen height by one-half, while maintaining its normal width. This narrowed the angle subtended by the electron beam onto the screen. According to Sinclair, this reduces distortion and the amount of deflection power required. Normal picture height (aspect ratio) is restored optically by a Fresnel lens, made cheaply from a plastic faceplate. A correcting voltage to the vertical deflection plates corrects the inherent trapezoid distortion.

The connections to the elec-



The electron gun is parallel to the screen in Sinclair's 3-inch flat-tube black-and-white, hand-held TV.



The deflection plates and Fresnel lens used in Sinclair's flat picture tube overcome the defects inherent in a side-mounted electron gun.

Electronic Engineering Times

Monday, March 16, 1981

(Continued from Page 1)

tron gun and deflection assembly are screen-printed onto the faceplate. Since the electronic assembly is attached to the faceplate in a single step, manufacturing costs are reduced, says Sinclair. The new tube also has significantly fewer components than a conventional CRT.

The screen for Sinclair's flat CRT is assembled from just two sheets of glass: a flat front plate, and a vacuum-formed backing plate. The phosphor screen is coated on the inside of the backing plate, and is viewed through the front plate, from the same side that the electrons strike. As a result, the brightness is more than double that of a conventional CRT with the same beam energy. (In a conventional CRT, the viewer sees the image through a binder that binds the phosphor to the screen. The binder, however, reduces brightness.)

Sinclair feels its new flat tube will find acceptance in projection-TV systems. Conventionally designed projection systems use a small picture tube, driven as hard as possible to produce the brightest possible image. This not only creates a problem in cooling the phosphor coating, but picture tube life span is shortened. In Sinclair's screen, the viewer and the electron source are on the same side, allowing a heat-sinking device to be attached to the entire rear surface of the phosphor-coated plate.

Though a color flat-screen TV has not yet been developed, Sinclair is working on a 50-in. color projection system, whose electronic and optical assemblies are mounted in a shoebox-sized unit.

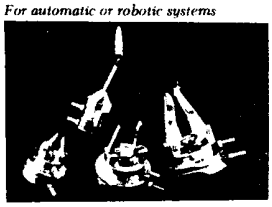
Flat-screen TVs have been the focus of much research for many years (Sinclair itself spent five years and $2 million), and a number of different technologies have been explored. LED, electrofluorescent and plasma displays have been tried, but they suffer from lack of brightness and low luminous efficiencies. Experiments with liquid crystal picture tubes have garnered limited success: They are low in power consumption and can produce an acceptable image. But because they generate color with difficulty, it is thought that LCD TV sets will be limited to monochrome.

RCA has developed a flat-screen, color CRT it feels will be successful commercially. This system uses a technology similar to Sinclair's. RCA will describe its flat CRT at the April 1981 Electro Show.

Sinclair Research, Boston, MA 02114. (617) 742-4826

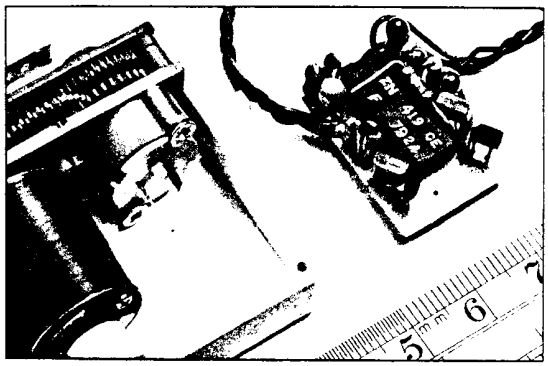
MINIATURE GRIPPERS

For automatic or robotic systems



Hydraulically or pneumatically powered B•A•S•E™ Grippers are available from stock in two- and three-finger versions, in four sizes, and with a choice of several finger shapes. Units ranges from about twice thimble size to approximately the size of a human hand. Finger shapes include external gripping, internal gripping, and a soft blank version which can be modified to any configuration desired by the user. Maximum operating pressure is 300 psi, but many applications use plant air at 80 psi; pinch force at 80 psi is 5-50 lb. The smallest units weigh 2 oz, the largest, 9 oz. Contact Mack Corp., P.O. Box 1756, Flagstaff, AZ 86002 (602) 526-1120.

Servo IC for radio control helps conserve power



The ZN419CE monolithic servo controller has many power saving features, making it well suited for battery-powered applications.

Specifically designed for radio control applications, Ferranti Electric's ZN419CE precision servo IC contains the major components of a feedback control system. Housed in a 14-pin molded DIP, the time-division-multiplexed circuit controls pulse-width position servos in small mechanisms.

The monolithic controller can operate from a single 5-V supply and draws just 6.7 mA in the quiescent state, making it suitable for battery-operated equipment. A balanced deadband control circuit prevents the control system motor from hunting around its quiescent point, thus increasing battery life.

Drive capability of the on-chip pnp output transistors is 40 mA min and 70 mA max at 25 C. At −10 C, the values are 35 mA min and 65 mA max. Saturation voltage of the output transistors is at most 0.4 V, at a load current of 400 mA.

The chip contains a voltage regulator that has a nominal output of 2.2 V. This output supplies 1.3 mA from −10 to 65 C.

Total dissipation from the DIP package may not exceed 300 mW, and the operating temperature range is −20 to +65 C.

A nonlinear pulse-expansion circuit with a Schmitt-trigger output prevents the motor from remaining stationary and drawing full stall currents for small drive periods. Stall current can be many times greater than the IC's quiescent current, a condition that severely restricts battery life in remote-controlled equipment.

In 1000 piece quantities, the devices cost $2.20 each. The price is $3.25 in lots of 100 pieces. Delivery time is from four to eight weeks.

Ferranti Electric Inc., Semiconductor Products, 87 Modular Ave., Commack, NY 11725. Ken Kushman (516) 543-0200.

PROGRAMMABLE SEVEN CHANNEL RC ENCODER — NE5044D

Temperature Range
Commercial −20°C to 75°C

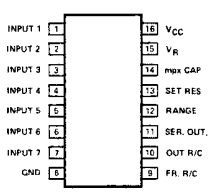
FEATURES

- Supply voltage 17V max
- 3 to 7 channels, externally selectable
- Constant current dual linear ramp for linearity better than .3%
- Internal voltage regulator for low drift
- Wide supply range 4.5V - 16V
- Fixed or variable frame rate set by external R-C
- External control for channel gain or range
- Versatile application; exponential rates, mixing, dual rate, reversing, etc.
- Compatible with all transmission mediums

APPLICATIONS

- Radio controlled aircraft, cars, boats and trains
- Industrial controllers
- Remote controlled entertainment systems
- Security systems
- Instrumentation recorders/controls
- Remote Analog/Digital data transmission
- Automotive sensor systems

ORDER PART NO. NE5044D



SEVEN CHANNEL RC DECODER — NE5045D

Temperature Range
Commercial −20°C to 75°C

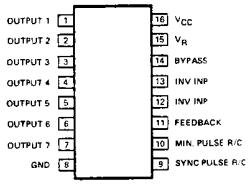
FEATURES

- Supply voltage 10V max
- Decodes up to 7 channels
- High gain input amplifier
- Externally set sync. pause and minimum pause
- Wide supply voltage range, 3.6V - 8V
- Positive or negative pulse inputs
- Noise and flutter rejection
- Outputs reset to zero without inputs
- Compatible with all transmission mediums

APPLICATIONS

- Radio controlled aircraft, cars, boats and trains
- Industrial controllers
- Remote controlled entertainment systems
- Security systems
- Instrumentation recorders/controls
- Remote Analog/Digital data transmission
- Automotive sensor systems

ORDER PART NO. NE5045D



Dave Corner's Monode article has finally been immortalized in National print! See page 130 of the Dec. '81 issue of 73 Magazine for the article.

BITS AND P.C.'S

I have a small television with a picture tube in it that has a burned out filament. The set is a Symphonic TPS-30, and the tube is a 3" diagonal one, part number C6407. I would be interested in getting another tube or TPS-30 with a tube in it. The rest of the TV works fine and I want to turn it into a video monitor.

Signetics has a new line of IC's that they have recently put on the market. The chips are the same, but the packages are much smaller. The long awaited flatpack size 555 is finally here! The chip series is called the SO series. Pin spacing is a mere .050" apart, half that of a standard DIP. The 8 pin package is 0.188 - 0.197 long, 0.150 - 0.158" wide, and 0.053 - 0.069" high. I have ordered 100 of the 555's through the institute on "personal purchase order" - a nifty system of buying things through a nonprofit institution and getting price breaks. I will have them with me at Windycon, assuming the distributor gets them to me in time. If enough people want more, I'll consider sending another order through. My cost is 55¢ each plus shipping, handling, sales tax and all that other rot. Figure that you'll have to pay me 65¢ apiece by the time all that adds on. If you want me to send them through the mail to you, add on another dollah to the total of the order. Many of the popular LM and NE linear series are also available in these packages. Two which might be of particular interest to you folks are the ones I've printed the summaries for on the previous page. Cost for them is about $3.00 each in single quantities.

I have scrounged a large military array processor that was scrapped here at work. TTL having been obsolete here for years, I find that I now have them coming out the wazoo. Most of them are either H or S series. Numbers include:

7400 Quad 2-in NAND
7401 Quad 2-in NAND Open Collector outputs
7404 Hex Inverter
7408 Quad 2-in AND
7410 Triple 3-in NAND
7411 Triple 3-in AND
7420 Dual 4-in NAND
7430 8-in NAND
7437 Quad 2-in NAND Buffers
7451 Dual 2-wide 2-in AND-OR-INVERT gates
7452 Expandable 4-wide AND-OR gates
7455 2-wide 4-in AND-OR-INVERT gates
7464 4-wide AND-OR-INVERT gates
7473 Dual JK FLIP-FLOP with Clear
7474 Dual D positive edge trig FF w/ Preset & Clear
7485 4-bit Magnitude Comparators
7486 Quad Ex-OR
74126 Tri-State Quad Buffers
74138 Decoder/Demultiplexers
74153 Dual 4-line to 1-line Data Select/Multiplex
74157 Quad 2-line to 1-line Data Select/Multiplex
74158 Ditto
74174 Hex/Quad D Flip-Flops w/ Clear
74175 Ditto
74183 Dunno
74195 4-bit Parallel Access Shift Registers

They can be had for trade, cash, or any other type of bribe you think I might be susceptible to. They are untested but probably good except for a few out of a few thousand. The reliability is good and high (for those that do work). Best of all, they're cheap. The MTU Synthesizer Project gets first dibs. Quantities vary, but the total number of chips is just shy of a cubic foot!

I still have quantities of the synthesizer chips for sale also. Includes VCO's, VCA's, ADSR's, and a few VCF's.

I can get 8" floppies through the stockroom at $5.50 for a Wang, $7.50 for a Verbatim FFGS-2000, $6.00 for a Memorex FDIV and $2.70 for a Mini Maxell MDI. Would some of you computer jocks please tell me if these are good prices or name a cheaper supplier? Thanks.

Did you folks know that the RCA 1802 is the only Micro that has been to Mars and the bottom of the ocean? We need low power consumption so all of the instruments use CMOS. We have some of the new NSC 800 micro's but they take about five times the power of the 1802. We will probably use only a few of them until our instruments get so complex that the extra power/speed is needed.

When you watch a movie on HBO or videodisk or tape you are only seeing 34% of the film! American Cinematographer ran an article on this a while back. When they format the standard wide-screen film for television, they not only cut off the edges but parts of the top and bottom. Figure out the cost savings of your movie channels now!

After many months of driving my Honda around with Michigan plates I finally put my Massachusetts plate on. Does this mean that after all these years I can now qualify as the official General Technics Mass. Driver?

Long ago in the mists of ancient time there was a public radio station known as WGGL in Houghton. On the night before its ill-fated demise, they played an SF radio show called Stars 'n' Stuff done by a group known as ZBS Productions. I've had the address kicking around and finally sent them some money, for which I got a set of six cassettes. The stuff is interesting, some of it even good. Let me know if you'd like to borrow my tapes.

Anyone interested in buying a used Sigma 7 can put a bid in to WHOI. We just got another VAX and are getting rid of the old Sigma. Highest bid so far is $21,000.00. Send bids to Property Office, Woods Hole Oceanographic, Woods Hole, MA 02543. I think Dec. 29 is the date of disposal, so you have to move quickly to have a chance.

This is my third Pyro, and I have found through experience the best substance to use for paste-up. It's not rubber cement, mucilage, Elmer's, wheat paste, or even the ever present glue stick. The thing to use is good ole GE silicone compound. It doesn't curl the photos or articles, it can be pulled up and re-stuck within fifteen minutes, and when it dries, the articles don't crack off the paper! The only problem is the Acetic acid smell it gives off (but that's like perfume to a real techie!). If you're thinking of doing a Pyro, give it a try. I've got a glue stick sitting here that I've not used since I found out how good the silicone works!

My nomination for techie tool of the year (and the obvious winner since nobody else nominated any) is the "Champion" Swiss Army Knife made by Victorinox. This is the knife that started the idea for the Kzinti Army Knife, etc. It is the largest model made, with everything including a magnifying glass, corkscrew, wood saw, and toothpick. I have used every blade on the knife at least once, and I wear it on a belt pouch since I end up using it on the order of a dozen times each day. It has got to be the handiest tool I have ever bought, and well surpasses even the Dremel Moto-Tool in usefulness. I recommend that you all go out and buy one this afternoon. It took me three years to break down and fork over the cash, and I'm kicking myself for not doing it sooner. Now that I carry it, I've been able to reduce the inventory in my techie kit by about a pound!

I've gotten back from my second research cruise already as I type this (11 Dec). The report will be coming out in a future issue of Pyro so I can take the time to write it up well (probably #31).

News flash!!!!!!!!!!!! 10 December, 1981

Bill Higgins has informed me that the Galileo project has been cut from the fiscal 1983 budget. Galileo was the probe that was supposed to orbit Jupiter and drop several probes to the surface. We've got to act fast to be able to get this back into the budget. I am asking every one of you to send letters to your Senator and Congressmen asking for the Galileo project to be funded. Use the guidelines that have been printed in past issues of Pyro. George Keyworth, The President's Science Advisor, is another man who should receive a letter from you. Write to him at: The White House Office of Science and Technology, The White House, 1600 Pennsylvania Avenue, Washington, D.C. 20005. If you haven't got the time, the inclination, or whatever to spend a measly hour writing three or four damn letters, then don't go whining about the probe being cut out when it's too late. Get off yer duffs and lets try to do something about the idiotic slashing Reagan and his friends are doing to the space and other science budgets.

While on the subject, I might as well bat about the rumor that the funding has also been cut for listening to the return signals from Voyager when it gets to Uranus and Neptune. This sounds too asinine to be true, but we are dealing with Government here. Does anyone have the latest information on this that is any more than a rumor? If so, get it to George Ewing and Lee Hart for printing in the upcoming Ann Arbor Pyro.

You Rochester folk can fly out to Cape Cod for $65 to $80 round trip . There is a guy who works at Xerox who's wife lives on the Cape. He commutes weekends! He is a certified instructor and the costs vary because it is a matter of splitting expenses. His plane can carry three passengers and minimal baggage. He will drop you off in Boston or Hyannis, possibly Falmouth if you ask nicely. Keep this in mind when you decide to come visit me someday (please?). His name is Ed Williams and his phone number is (716) 275-5216 days. I don't know if he flies during the winter or not, but if so it would be a cheap way to get to Boskone.

Divers should know about the Mariner watersport watch by Casio. If you don't: It is a digital alarm/chrono with a light and a dual display that always keeps the time displayed; it costs $35 to $40; it has a countdown timer that sounds an alarm when it runs out; it has large friendy buttons that are easy to operate through wetsuit gloves; and it is good and waterproof to a depth of 100 meters! The test reports from Skin Diver and our WHOI dive master indicate that the watch is one of the best diving watches to come out in a long time - and it is sinfully inexpensive. Pick one up and spend the saved bucks on a better regulator or BC.

Tonight the local Sultans of SWAT are practicing at WHOI. They are repelling off the high bay building where service work is done on Alvin. The guard says that they will be doing a search exercise in the building, "so don't get alarmed if someone sticks an M-16 in your face". I didn't think there was enough call for a SWAT team on the entire Cape!

I want to get going on the special issue of Pyro to be known as Electronic Stuff - The Magazine for the Professional Engineer. I need articles, ads, pasteups and all order of madness for it. I would like to set an April release date, but knowing the way you folks just deluge us editors with articles I figure it will have to be much farther in the future than that! Everybody just start sending me stuff to that effect and when the pile gets big enough I'll throw it into the printer. Use the standard 5" Pyro format please (double column stuff is also acceptable).

My apartmentwarming didn't seem to pull in as many folks as I had hoped. Phil, Roxanne, Ozzie, and Charlotte stopped in for the weekend while Dick Smith & friend just showed up Saturday evening. The standard WHOI tour was given and we almost rode the drawbridge. I shall therefore run my next berserker on the same basis as those in Houghton. When you get a critical mass of folks who can make it on the same weekend together, let me know (a minimum of two weeks in advance, please - I just may be out on a cruise). The Cape is at its best in late May or early June before all the tourists get here. Mary Lynn seems to be thinking of organizing the first big trip out. I might hasten to remind you all that I am a mere 80 miles from Boston, and the busses run from downtown to downtown for about $5.25 one way. Boskone is going to be held Feb. 12 - 14 and I am accepting mattress space reservations for Thursday night prior to it (after the first three or four you get the floor).

You who want to call me can do so by dialing (617) 540-3250 (home) or (617) 548-1400 x2421 (work). The atmosphere is relaxed enough that I can get calls during the day without fear of reprisal if they're not too long.

Many thanks to Bill Higgins and Jann Frank for the illos on such short notice. I miss the good old days of having a Cloutier on leash for those needed to liven things up!

CAP'N AL

179 WOODS HOLE RD

FALMOUTH, MA 02540

first class!

TO: